

The background of the entire advertisement is a green and grey marbled paper pattern. A horizontal grey band runs across the middle of the page, serving as a backdrop for the text.

Brookfield
SYNCHRO-ELECTRIC
Viscometer

A PRECISION PRODUCT OF THE BROOKFIELD ENGINEERING LABORATORIES, STOUGHTON, MASS., U. S. A.

IN USE THE WORLD OVER

product dimension

There are many dimensions of a product that can indicate its quality, acceptance, or performance in its intended use. Color, density, stability, composition, solids content, and pH are all examples of this type of "product dimension."

The increased ability of the manufacturer and consumer to measure, evaluate, and control these influencing factors is due largely to continuing developments in instrumentation. The products of the instrument maker have gradually brought the manufacture of goods from an empirical art to an exact science. A producer or consumer no longer can afford to ignore these "dimensions" — he must measure, evaluate, and control them if he is to compete and prosper.

A material's flow properties are important "product dimensions" — to describe them completely is to describe its pourability, its penetrating characteristics, its performance in a dipping or coating operation, or the ease with which it may be handled or used. The interrelation between flow properties and other product dimensions often makes measurement of these properties the most sensitive or convenient way of detecting changes in color, density, stability, solids content, and molecular weight. Flow property measurement can often by itself bring the manufacture or use of a product to an exact science. The Brookfield Synchro-Lectric Viscometer is by general consensus the most practical and precise instrument for the measurement of flow properties.

The study and evaluation of fluid flow properties is part of the science of Rheology. The design of the Brookfield Synchro-Lectric Viscometer permits its use as an invaluable tool in this application *no matter what these flow properties may be*. Such is not the case with other commonly available instruments. If a material is a suspension, emulsion, if it contains solids or even long molecules (and 90% of industrial materials do) a cup or capillary, orifice, sonic, or falling weight Viscometer will fail to give a complete picture of flow properties and, in many cases, will present erroneous results. Only multi-speed rotational Viscometers can be used with universal effectiveness on all types of materials — of these, only the Brookfield Synchro-Lectric Viscometer has the design features that have made it at home in the hands of the Ph.D. or production worker, in the research laboratory or on the manufacturing line. Whoever uses it or wherever measurements are made, its accuracy and precision will be unvaryingly excellent.

The principle of operation of the Synchro-Lectric Viscometer is simple and proven. A cylinder or disc is rotated in the fluid under test through a beryllium-copper spring. The deflection of the spring is read on a dial. The dial reading is multiplied by a simple constant to obtain the resulting viscosity at the particular rotational speed. Measurements made at different speeds are used to describe the complete flow properties of the material at hand.

The Synchro-Lectric Viscometer will fill the needs of the manufacturer or consumer — it will permit the measurement, evaluation, and control of many product dimensions.



Brookfield

*A
complete
viscosity
measuring
system*

The Brookfield Synchro-Lectric Viscometer is the basic element of a product line that can provide a complete answer to virtually every viscosity measuring problem. While the majority of applications will require only the use of the Viscometer, a number of specialized accessories are available that will permit its use in applications involving extremes in viscosity, temperature, or corrosion. In addition, the staff of Brookfield Engineering is available for technical service regarding any particular problem.

Brookfield Synchro-Lectric Viscometers Have These Advantages

accuracy

All models are guaranteed to be accurate to within 1% of whatever range is employed. The sensitivity and reproducibility of the instruments is 0.2% — easily readable on their 13½" scale.

speed of use

A viscosity determination generally takes less than 25 seconds — the making of a complete flow curve less than 40 seconds.

ease of operation

The Synchro-Lectric Viscometer is simple enough for even the most unskilled personnel to operate with accuracy and speed.

reliability

All constants affecting the accuracy of the Brookfield Synchro-Lectric Viscometer are such that continued use and abuse will not change their characteristics. The beryllium copper spring — which is the "heart" of the unit — is unaffected by extremes of temperature or continued flexing. Instruments returned for cleaning have been found to show no change in their calibration after having been in service for 15 years.

ease of cleaning

All portions of the Synchro-Lectric Viscometer coming in contact with the test material are quickly removed. All surfaces are smooth for easy and rapid cleaning.

portable

Weighing only 3½ pounds, the Brookfield Synchro-Lectric Viscometer may be carried through the plant for on the spot measurements. This frequently relieves the quality control laboratory from additional work and places the point of measurement at the point of process — where it should be!! The handle is readily removed for mounting on a Brookfield Laboratory Stand or other support.

direct reading

in centipoises, the fundamental unit of viscosity measurement. This is the absolute viscosity unit as well as the accepted scientific standard in use throughout the world.

wide ranges

are possible due to the number of speeds and spindles that are available. The ratio of maximum to minimum ranges is never less than 1000:1 with four speed Viscometers: with those having eight speeds, the ratio can be as high as 80,000:1. Each range has zero as its low value so many overlapping ranges are provided for maximum sensitivity. A single instrument model can cover an extremely wide range of products.

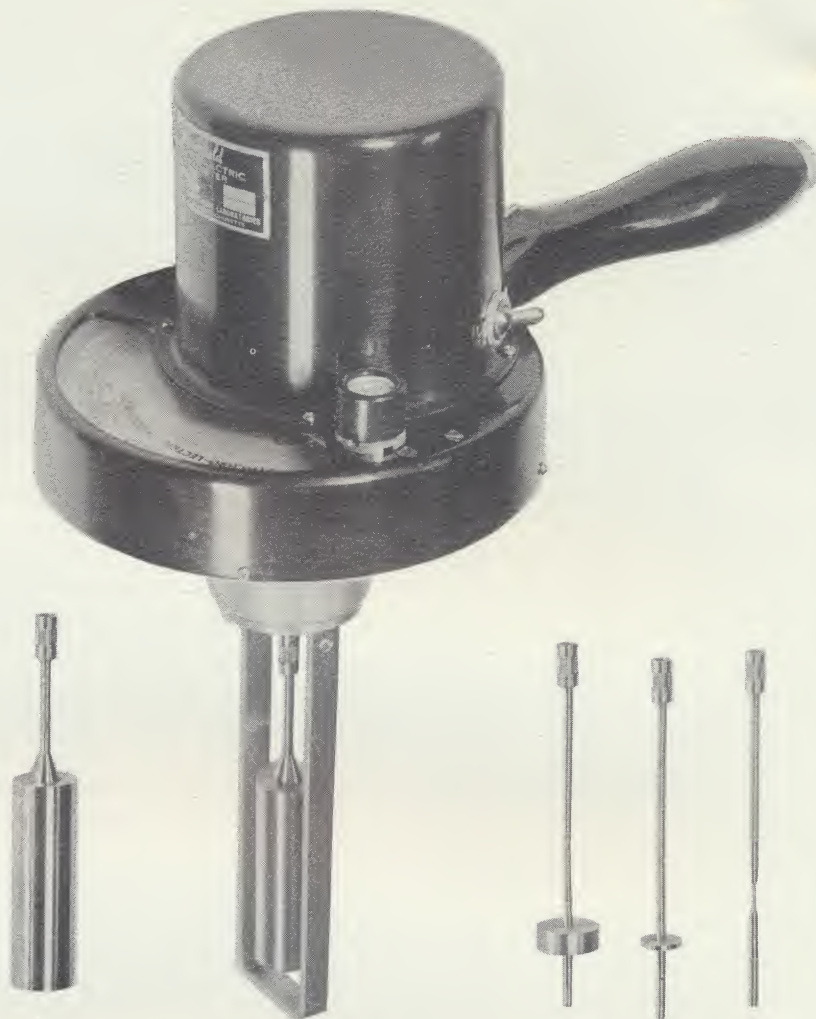
flow properties

are quickly and easily determined with the Brookfield Synchro-Lectric Viscometer due to the many speeds at which its spindles can rotate. Such non-Newtonian properties as pseudoplasticity, plasticity, and dilatancy can be readily detected — flow curves of thixotropic materials can be obtained. Exact rates of rotation are produced by a synchronous motor driving a gear train in which the speeds may be instantaneously changed.

wide usage

Brookfield Viscometers play an important part in the measurement of fluid properties both in commercial specifications as well as industry-wide testing procedures. Their acceptance throughout the world gives assurance that your results and tests can be duplicated by your suppliers and customers — wherever they may be.

Brookfield



LV Models — 4 spindles, spring tension
673 dyne-cms full scale

LVF — 4 speeds, 60, 30, 12, and 6 rpm
— 16 ranges
minimum range — 0-100 cps
maximum range — 0-100,000 cps

LVT — 8 speeds, 60, 30, 12, 6, 3, 1.5,
0.6, and 0.3 rpm — 32 ranges
minimum range — 0-100 cps
maximum range — 0-2,000,000 cps

LV MODELS

The LV series is designed to measure materials in the low viscosity region. The lower limit of effective measurement is 15 cps — below this viscosity, the use of our UL Adapter is recommended for truly accurate results. Although calibrated for use in a 600 cc low form Griffin beaker, this model, as all other Brookfield instruments, may be used with much smaller samples if required.

LVF Viscometers find particular application in the rubber, latex, cosmetic, textile, electrical manufacturing, petroleum, and heavy chemical fields. Although it has been used successfully with the Helipath Stand, its use with this accessory is not recommended if one of the heavier duty Synchro-Lectric Viscometer models is found to be suitable.

The LVT is suggested as a research tool and in applications where a large viscosity range is to be covered. It has been used both with and without the Helipath Stand by many pharmaceutical manufacturers since measurements can be made with ease on products ranging from the thinnest lotion to the heaviest face cream. Its four lower speeds permit readings to be made at extremely low shearing rates.

Each Viscometer model is designated by a series of three letters. The first two identify the particular spring and spindles common to the model, while the last designates the number of speeds found in the instrument. For example, our models LVF and LVT both have the same spring and spindles although the former has four speeds and the latter has eight. The RV-, HA-, and HB- models all have the same spindles (3 to 7) and differ only in their springs and speeds.

In some cases the particular operating constants of a specific model make it especially suited to a given product either by reason of range, sensitivity, shearing rates, or common usage. The description of the Viscometers shown in this brochure will help in selecting the model best suited to your needs and requirements.

Four speed "F" Viscometers have a



RV Models — 7 spindles, spring tension
7187 dyne-cms full scale

RVF — 4 speeds, 20, 10, 4, and 2 rpm —
28 ranges
minimum range — 0-500 cps
maximum range — 0-2,000,000 cps

RVF-100 — 4 speeds, 100, 50, 20,
and 10 rpm — 28 ranges
minimum range — 0-100 cps
maximum range — 0-400,000 cps

RVT — 8 speeds, 100, 50, 20, 10, 5, 2.5,
1.0, and 0.5 rpm — 56 ranges
minimum range — 0-100 cps
maximum range — 0-8,000,000 cps

RV MODELS

10:1 ratio of maximum to minimum speeds. They are the instruments upon which most accepted test methods, product specifications, and quality control work are based. A four speed Viscometer will be well suited for day to day testing and for research within known ranges.

Eight speed "T" Viscometers offer greater flexibility of use due to their 200:1 ratio of maximum to minimum speeds. They are particularly recommended in product development work or rheological investigations. In applications requiring measurement over an extremely wide range or those in which the Helipath Stand is used, eight speed Viscometers will be of particular value. These instruments may also be used in place of many four speed models due to the number of speeds the two types have in common.

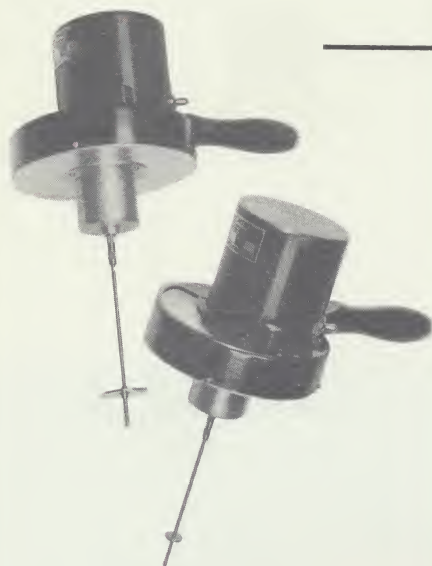
The RV series is primarily intended for use in the medium viscosity ranges. The lower limit of effective measurement of the RVF is near 80 cps while with the RVF-100 and RVT, this limit is about 25 cps. A slight non-linearity will be noted with the latter instruments when measuring below 50 cps at 100 rpm. This is due to turbulent flow at this speed and will in no way affect the reproducibility or sensitivity of the units.

The standard RVF is used for gums, adhesives, chocolate, many food products, paints, surface coatings, starches, clay slips, and a wide variety of other products having comparable flow characteristics.

The RVF-100 differs from the standard RVF only in its speeds and ranges. It is suggested for use with paper coatings, organosols, and plastisols where measurement at higher rates of shear is desirable.

The RVT can be used with greater effectiveness than its four speed counterparts with any of the above products. Besides being a more flexible tool, it has become increasingly popular for the measurement of gels and similar materials with the Helipath Stand. The RVT has also been successfully used for the measurement of molten glass and other extremely viscous materials at elevated temperatures.

HA AND HB MODELS



7 spindles, spring tensions 14,374 dyne-cms and 57,496 dyne-cms respectively.

HAF — 4 speeds, 10, 5, 2, and 1 rpm — 28 ranges

minimum range — 0-2000 cps

maximum range — 0-8,000,000 cps

HAT — 8 speeds, 100, 50, 20, 10, 5, 2.5, 1.0, and 0.5 rpm — 56 ranges

minimum range — 0-200 cps

maximum range — 0-16,000,000 cps

HBF — 4 speeds, 10, 5, 2, and 1 rpm — 28 ranges

minimum range — 0-8000 cps

maximum range — 0-32,000,000 cps

HBT — 8 speeds, 100, 50, 20, 10, 5, 2.5, 1.0, and 0.5 rpm — 56 ranges

minimum range — 0-800 cps

maximum range — 0-64,000,000 cps

HA and HB models are designed primarily for work with very high viscosity materials such as tars, asphalts, and roofing compounds. It is not suggested that they be used for the measurement of low viscosities (less than 20% of their minimum range) since either the RV or LV models are available for more sensitive readings. Gels, jellies, heavy greases, and semi-solid pastes have been measured with these instruments when used in conjunction with the Helipath Stand. To facilitate cleaning, HA and HB models are supplied without guard legs.

EXPLOSION PROOF MODELS



U. L. and CSA approved explosion-proof construction can be provided for any Viscometer model. The switch and power connections are made from explosion-proof fittings while the motor is housed in a machined-from-the-solid aluminum case. Underwriters' Laboratories approved for Class I, Group D locations, such explosion-proof models are indicated by the suffix "E" after the model designation.

Any Brookfield Viscometer can be made virtually "explosion safe" through the substitution of a mercury switch for the toggle switch normally provided. The standard motor driving the unit is brushless with no sparking whatsoever. Unless severely damaged, such a unit will have no arcing and can be used with safety.

SPINDLE EXTENSIONS



Many times it is desirable to increase the distance of the spindle from the Viscometer when making a measurement. This may be necessary due to fumes rising from the fluid, the temperature of the test material, or the need for measuring in a deep vat or tank. To accomplish this, a fine wire extension is placed between the Viscometer and the spindle. Extensions have been made up to six feet in length. Materials at temperatures in excess of 2800° F have been safely measured in this fashion using an extension of only 2 feet.

The type D extension comprises an intermediate wire shaft which utilizes a standard spindle attached to its lower end. It is suggested for use where the immersion of the spindle can be detected and controlled or in preliminary work in establishing the most suitable type S extension.

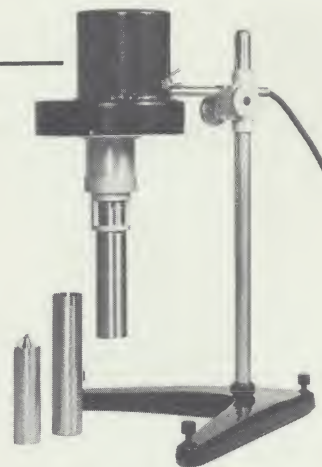
Type S extensions comprise the immersed portion of a standard spindle and a permanently attached wire extension. Their design is such that the depth of immersion is not a critical factor due to the relatively small diameter of the wire extension in relation to the immersed portion of the spindle. The use of such extensions is recommended in tanks or vats where foam or fumes prevent accurate control of the spindle's immersion to a fixed depth.

THE U L ADAPTER

The measurement of many dilute solutions, lacquers, inks, as well as some pure liquids, requires a degree of precision in the range of 0-10 cps not provided by our model LVF Viscometer alone. The use of the U L Adapter in conjunction with the Viscometer will extend the minimum range of measurement from 0-100 cps to 0-10 cps. Through the use of the Adapter, measurements can be made with a precision of 0.02 cps over this range. A sample of only 24 ml is required.

The Adapter consists of a large cylindrical spindle which is rotated within the walls of a tube, the tube being held concentric by a special adapter and pivot housing. Tubes are supplied having both open and closed ends and may be used interchangeably with no effect on the unit's calibration. The Adapter will permit measurement over the ranges of 0-10, 0-20, 0-50, and 0-100 cps as the speeds of the LVF are changed from 60 rpm down through 6 rpm. The Adapter may be quickly removed so that the LVF may be used in its normal fashion.

Apart from the U L Adapter, a special spindle is also available for measuring low viscosities. Known as a "10 centipoise spindle" it has a minimum range of 0-10 cps with the LVF. It produces a condition of turbulent flow and is intended only for comparative testing rather than as a precise analytical tool.



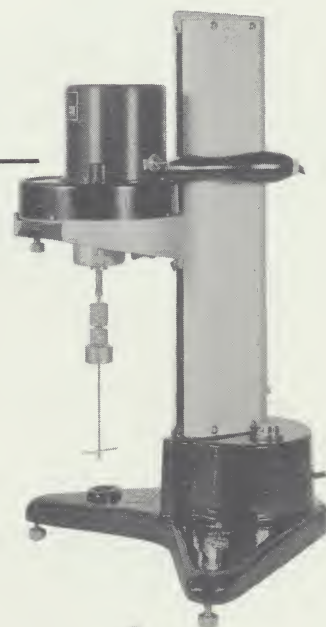
THE HELIPATH STAND

Until the Helipath Stand was developed, viscosity or consistency measurements on such materials as pastes, gels, and other non-flowing materials were extremely difficult to obtain. An element that was allowed to rotate in such a material would merely spin or "channel" in the cavity its rotation created.

By attaching a special bar-type spindle to a Synchro-Lectric Viscometer and allowing the Helipath Stand to lower this spindle continuously into the test material, the "channeling" effect is eliminated since the trace of such a spindle as it is simultaneously rotated and lowered, is a helical path. With the spindle always cutting into fresh material, meaningful measurements on such substances can be obtained with ease.

Materials having characteristics similar to whipped potatoes, hand creams, ointments, printing inks, Portland cement slurries, and toothpastes are being successfully measured. Since such substances generally have high "viscosities," operation with our heavier duty Synchro-Lectric Viscometers and at low rotational speeds is recommended, although the LVT is being used with some face creams and other semi-solids having low yield values.

The Helipath Stand is supplied as shown with a set of six spindles and special coupling.



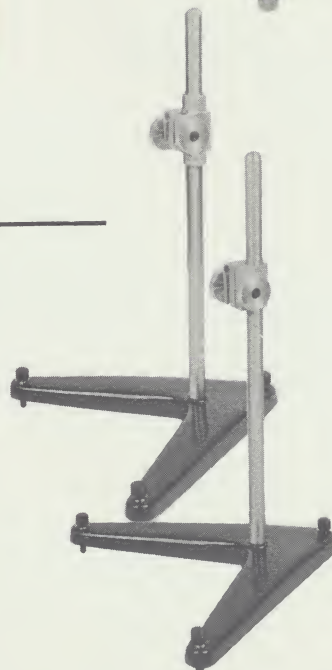
LABORATORY STANDS

Both Model A and Model B Laboratory Stands will provide a rigid and safe mounting for any model of the Brookfield Synchro-Lectric Viscometer. Their heavy cast iron base is finished in porcelain enamel and has three screws for easy setting of the Viscometer's level.

The Model A Stand has a rack and pinion system which permits convenient adjustment of the spindle's depth of immersion.

The Model B Stand is comparable to the Model A, but has a simple clamp which must be manually adjusted for height.

Stands are normally supplied with a 14" rod, although extensions are available to increase this height. Their use with your Viscometer will help to insure the instrument's safety and easy operation.



Viscosity Is Our Business:

Brookfield Engineering Laboratories has been exclusively concerned with the art of viscosity measurement and control for over twenty years. As specialists in this broadening field, we invite consultation on special problems or applications — our technical staff can most assuredly be of assistance!

Process Control:

In addition to the Brookfield Synchro-Lectric Viscometer, this company manufactures process mounted viscosity transducers for use with commercially available recording and controlling equipment. Literature on our Process Mounted Viscometers is available.

Guarantee:

All products of Brookfield Engineering are guaranteed for one year against defective materials and workmanship.

The logo for Brookfield Engineering Laboratories, Inc. features the word "Brookfield" in a stylized, italicized serif font. A small, white, teardrop-shaped graphic is positioned above the letter "i" in "field".

ENGINEERING LABORATORIES, INC.
240 CUSHING STREET
STOUGHTON, MASSACHUSETTS 02072



BROOKFIELD ENGINEERING LABORATORIES, INC.

BROOKFIELD Synchro-Lectric VISCOMETER

V I S C O S I T Y D A T A S H E E T

240 Cushing Street, Stoughton, Massachusetts, U. S. A.

To help us determine which Brookfield Viscometer Model would be best suited for your application, please furnish the information requested below.

Product(s) to be tested _____

Electrical current supply: Voltage _____ Frequency _____

Location of tests: Laboratory _____ Plant (Production) _____

Purpose of tests: Research _____ Control _____

Rheological characteristics of materials to be tested:

Newtonian _____ Thixotropic _____ Dilatant _____ Other _____

If materials are corrosive, state metals offering maximum resistance _____

Testing temperatures: Maximum _____ Minimum _____

Approximate viscosity range in centipoises _____

If actual viscosity in centipoises is unknown, indicate approximate viscosity by comparison with common liquids _____

If spindle extension is required, give brief description of conditions, such as: amount of foam if any, depth to liquid level, fumes, etc. _____

Additional information _____

Company _____

Address _____

By _____

THE BROOKFIELD HELIPATH STAND

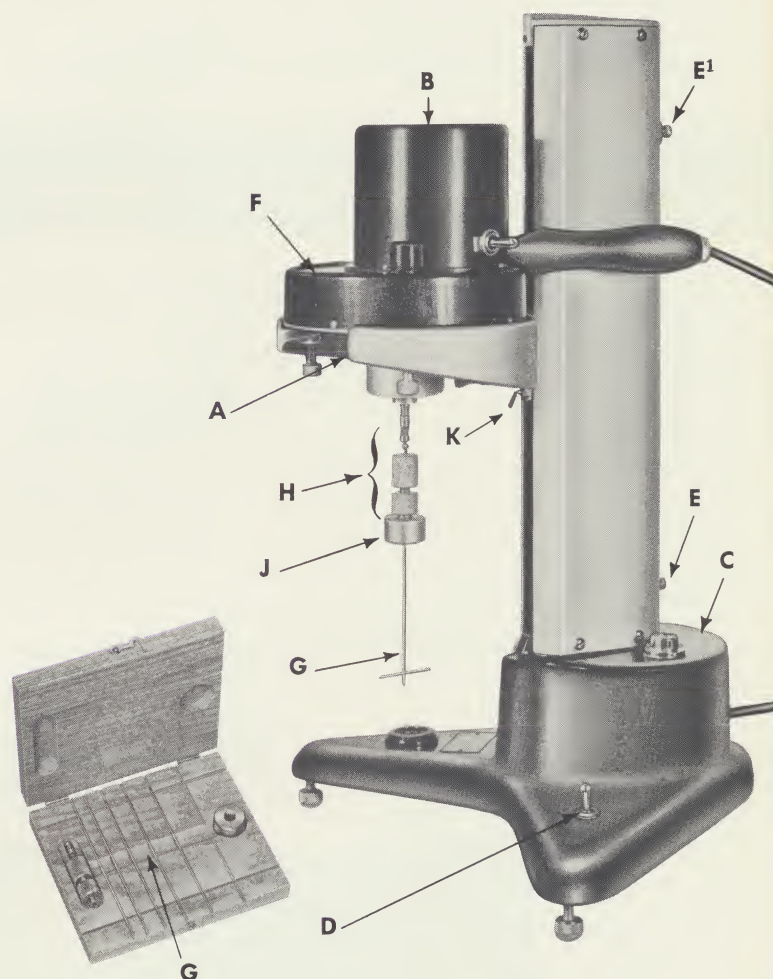
Permits the Testing, Study, and Control of Highly Plastic Materials Regardless of Degree of Thixotropy.

An accessory for use with the Brookfield Synchro-Lectric Viscometer permitting viscosity measurements to be made on gels, pastes, and other non-flowing substances.

The Brookfield Helipath Stand, when used with the suitable Brookfield Synchro-Lectric Viscometer fitted with a special bar-type spindle, will make consistency measurements in relative centipoise values of materials having characteristics similar to grease, putty, shaving cream, toothpaste, gelatin, or wax.

A spindle in the form of an inverted T is attached to the Brookfield Viscometer which is supported by the Helipath Stand as shown in the accompanying picture. As the spindle is rotated by the Viscometer, the Helipath Stand lowers it through the test material. The resulting path traced by the spindle's crosspiece is a helix.

Throughout its helical path the crosspiece constantly encounters new material and leaves that which its previous motion has agitated. Thus, the rotor always measures material which has an undisturbed structure. The torque required to rotate the spindle is registered on the Viscometer dial and may be conveniently converted to centipoise values.



Description

A horse-shoe shaped platform (A) supports any standard Brookfield Synchro-Lectric Viscometer (B) and is lowered by a chain housed in the supporting column. The chain is driven by a synchronous motor housed in the base of the unit (C) which is initially turned on by a switch (D).

An adjustable stop (E) can be set to stop the lowering action at any desired point. An additional stop (E¹) is provided on reversible models. During operation, readings are indicated on the dial of the Viscometer (F).

Calibrated Bar-type spindles (G) are secured into a chuck and closer coupling assembly (H). An extra weight (J) may be added to the coupling, if necessary, to insure the spindle's

perpendicular fall through the material. The drop of the supporting platform can be adjusted to a maximum of 11 inches. The platform is raised to its initial testing position by releasing a latch (K) and lifting.

The base of the Helipath Stand is a casting finished in baked porcelain enamel. All other exposed portions of the unit are either nickel-plated brass or aluminum.

Many substances have previously been considered unsuited for viscosity or consistency measurements with rotational Viscometers. Materials such as grease, shaving cream, and soap slurries all have such high yield values that any rotating

member, be it cylinder, disc, or paddle, will soon create a "channel" in the medium and after a very short time exert a negligible and meaningless torque on any sensing device. This effect also occurs with materials that have a gel structure.

Paint dries, lithographic inks, and many other substances are thixotropic in that their structure is broken down and their viscosity is decreased when subjected to internal shearing. While no rotating member will ever spin freely in such materials, the torque required to produce this motion will become less as the period of internal shearing lengthens. The study of such data will produce valuable information but will lead to difficulties and necessarily rigid testing procedures in product control work.

Other materials, notably cements and mortars, show a combination of the two effects listed above. They will show

a high yield value as well as a change in consistency with time. The accompanying graph gives data obtained with the Helipath Stand and Synchro-Lectric Viscometer from a sample of hardening resin cement. A special model of the Helipath Stand is available which will reverse itself, thus permitting measurements to be made on such materials over a long period of time.

The Brookfield Helipath Stand has been designed for use with the Brookfield Viscometer to determine the consistency of materials such as those described above. Generally, Viscometer models RVF, HAF, or HBF are best used with this apparatus although the LVF has been used in some cosmetic applications. See our general catalog for a complete description of these instruments.

RECOMMENDED TECHNIQUE OF MEASUREMENT

The preparation of a homogeneous sample is of primary importance in all consistency measurements. A non-uniform temperature distribution as well as the presence of large air bubbles and traces of extraneous materials should be avoided. With gel structures, large fractures will cause erratic readings. Some substances must be uniform "agitation-wise", and extreme care must be used in preparing the sample when thixotropic materials are to be measured.

Since virtually all materials to be measured with this equipment are non-Newtonian in nature, no correlation should be expected between results obtained using different spindles or when the same spindle is operated at different speeds. For this reason, readings should be reported giving the spindle size and speed of rotation at which they were made.

The following operating procedure is suggested. Set the

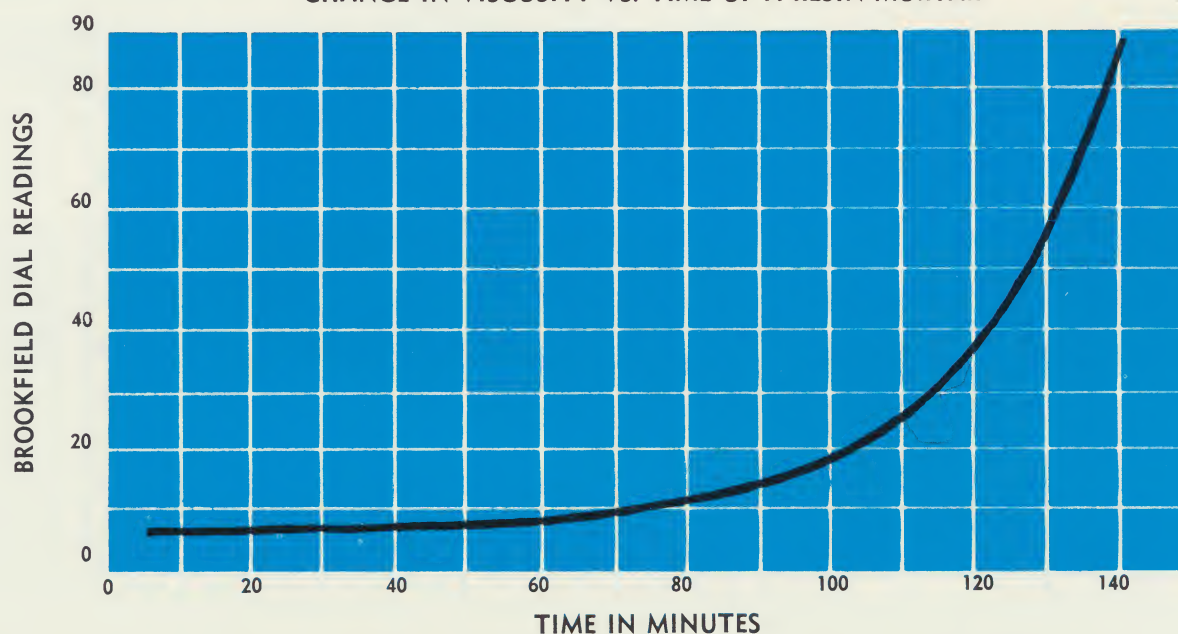
spindle so that the crosspiece is covered by about $\frac{1}{4}$ " of material. Start the Viscometer and let the dial make one or two revolutions before turning on the Helipath Stand. Note each reading as the needle passes a predetermined spot on the Viscometer dial. In this way, a figure will be obtained for the consistency at equal increments of drop through the material. Operation at low rotational speeds will usually produce optimum readings.

Due to the lowering action of the Helipath Stand, the spindles have been calibrated considering the effect of the crosspiece alone.

Spindles should be chosen so that the initial reading is about 50% of full scale deflection.

Cleaning of spindles after each set of readings is recommended.

CHANGE IN VISCOSITY VS. TIME OF A RESIN MORTAR

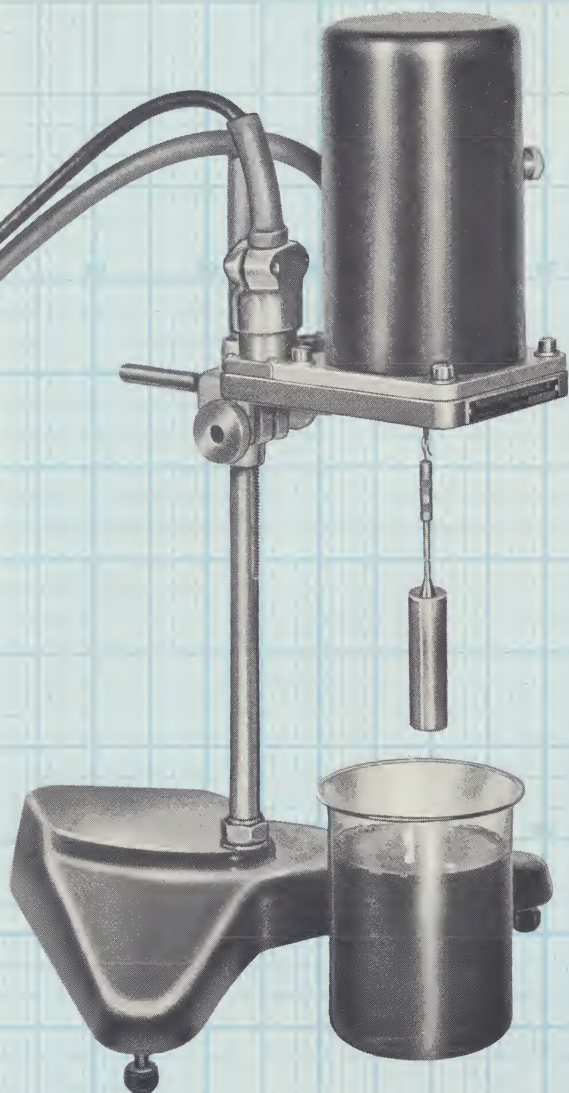


Brookfield ENGINEERING LABORATORIES, INC.
Stoughton, Mass.

PRINTED IN U.S.A.

FOR
CONTINUOUS
VISCOSITY
DETERMINATION

- CONTINUOUS INDICATING/RECORDING
- MULTI-SPEED
- DIRECT READING
- REMOTE TRANSMISSION
- EXPLOSION SAFE
- PORTABLE
- ACCURATE
- WIDE USAGE



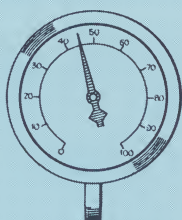
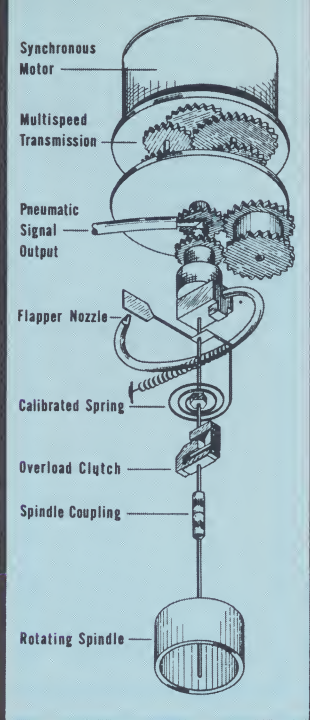
BROOKFIELD
RHEOLOG
LABORATORY
RECORDING/INDICATING
VISCOMETER

From the world leader in viscosity instrumentation, another element of a product line that can provide a complete answer to virtually every viscosity measuring problem — the Brookfield RHEOLOG.

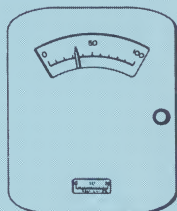
Built on the same proven principle as the Brookfield Synchronous Electric Viscometer, the RHEOLOG offers continuous laboratory indicating and/or recording of viscosity.

A spindle is driven at constant speed by a synchronous motor through a calibrated spring. The deflection of the spring caused by a viscous drag opposing the rotation of the spindle is a measure of torque. A flapper nozzle arrangement converts the spring torque to an air pressure in a completely linear fashion and is sensed by an indicator and/or indicator recorder.

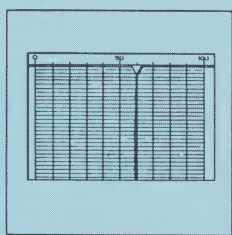
The Brookfield RHEOLOG is compatible with standard indicating or recording equipment from a simple pressure gauge to a strip chart recorder, available with pneumatic or electric signal transmission.



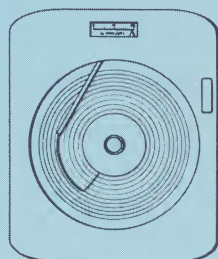
Pressure Gauge



Pressure Indicator



Strip Chart Recorder



Round Chart Recorder

Wide viscosity ranges are possible due to the number of speeds and spindles that are available. The ratio of maximum to minimum ranges is never less than 1,000:1 with four-speed RHEOLOGS. With those having eight speeds the ratio can be as high as 80,000:1. Each range has 0 as its low value so many overlapping ranges are produced for maximum sensitivity varying from 0-100 cps to 0-64,000,000 cps.

The Brookfield RHEOLOG is direct reading in centipoise — the fundamental unit of viscosity measurement. This is the absolute viscosity unit as well as the accepted scientific standard in use throughout the world. Flow properties are quickly and easily determined due to the multi-speed operation of the RHEOLOG. Such non-Newtonian properties as pseudo-plasticity, plasticity and dilatancy can be readily detected — flow curves of thixotropic, rheopectic, time-dependent and temperature-dependent materials can be obtained. Exact rates of rotation are produced by a synchronous motor driving a gear train in which the speeds may be instantly changed.

Remote transmission is possible at distances up to 100 feet — often advantageous when viscosity measurements are desired in closed or hazardous areas.

Powered by a synchronous motor in which no sparking or brushes are present, the Brookfield RHEOLOG is intrinsically explosion-safe. The pneumatic method of signal transmission insures that the RHEOLOG is continuously purged to prevent the entry of explosive fumes or vapors. In addition an air safety interlock switch can be installed for fail-safe insurance.

Weighing less than 14 lbs. the Brookfield RHEOLOG is an extremely portable unit. Design allows easy mounting on the Brookfield laboratory stand or other laboratory supports.

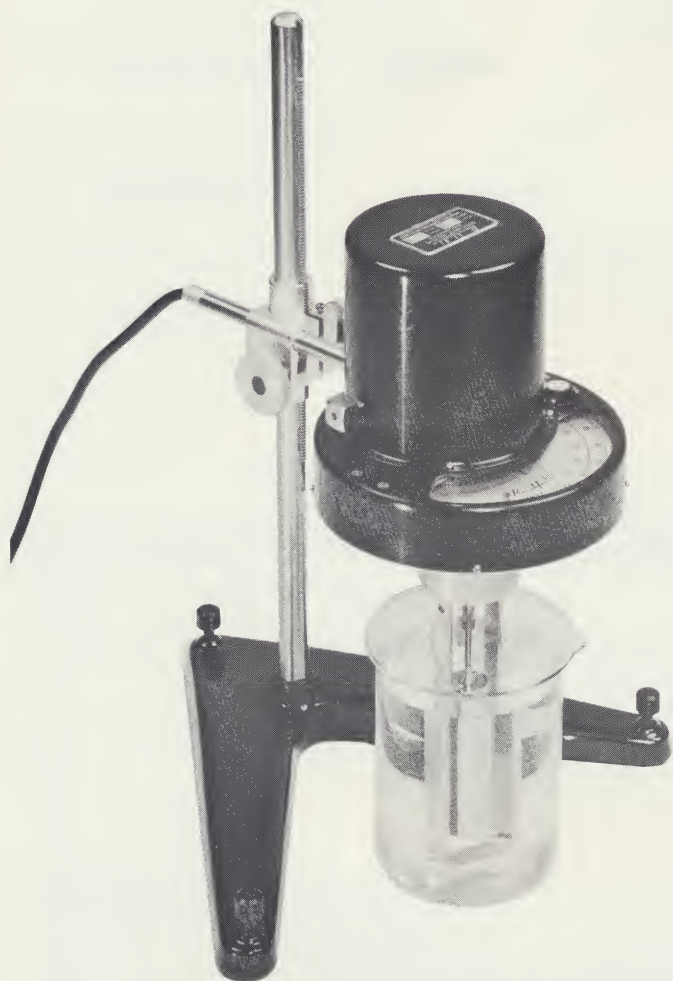
The Brookfield RHEOLOG is built with the same traditional accuracy of all Brookfield viscometric equipment. The sensitivity and reproducibility of the instrument is 0.5% of full scale in all ranges. All constants affecting accuracy are such that continued use and abuse will not change their characteristics. A beryllium copper calibrated spring is unaffected by extremes of temperature or continued flexing.

Brookfield Viscometers play an important part in the measurement of fluid properties, both in commercial specifications as well as industry-wide testing procedures. Their acceptance throughout the world is assurance that your results and tests can be duplicated by your suppliers and customers wherever they may be.

Brookfield

ENGINEERING LABORATORIES INCORPORATED
240 CUSHING STREET STOUGHTON, MASSACHUSETTS 02072

BROOKFIELD EIGHT SPEED SYNCHRO-LECTRIC VISCOMETERS



The "T" Series

A 200:1 Ratio of Maximum to Minimum Speed on Single Synchro-Lectric Viscometer Provides Increased Sensitivity, Range, and Applicability to Non-Newtonian Flow Problems.

Those familiar with the standard four speed models of the Brookfield Synchro-Lectric Viscometer will recognize their identifying letters — LVF, RVF, HAF, and HBF. Each model, while operating on the same principle, is characterized by its own spring tension, shaped spindles, and combination of four speeds. The range and usefulness of each of these models has been increased by producing an eight speed model having all the other operating characteristics of its four speed counterpart. The LVT, RVT, HAT, and HBT Synchro-Lectric Viscometers comprise the eight speed "T" series.

Eight speed Viscometers are operated in the same fashion as the standard four speed units. A square knob found on the side of the Viscometer is the speed control — when turned it will produce rotational speeds in one of the following combinations — 60, 30, 12, 6, 3, 1.5, 0.6, and 0.3 rpm (LVT) or 100, 50, 20, 10, 5, 2.5, 1.0, and 0.5 rpm (RVT, HAT, HBT). Rotation at exact speeds is assured by using a synchronous motor and gearing in much the same fashion as found in the standard four speed Synchro-Lectric Viscometers. Turning the knob will change the speed to the next higher or lower speed depending on the direction in which it is rotated.

ADVANTAGES OF EIGHT SPEED VISCOMETERS

1. Increased range: Those working with a large variety of products have found eight speed Viscometers to be particularly advantageous since with such an instrument, their entire product line could be measured with sufficient sensitivity. In some cases, one eight speed instrument can be used in place of two different four speed models.

2. Increased sensitivity: The sensitivity of the four speed RVF, HAF, and HBF Synchro-Lectric Viscometers in the low viscosity region has been improved upon since the 100 rpm top speed of their eight speed counterparts, the RVT, HAT, and HBT, has the effect of amplifying the dial readings that would otherwise be obtained on low viscosity materials.

3. Non-Newtonian Flow: The 200:1 ratio of maximum to minimum speed represents a 200:1 ratio of maximum

to minimum shearing rates. This ratio permits rate of shear — shear stress diagrams (rheograms) to be plotted over very wide ranges — through such plots a more complete picture of a material's viscous behavior can be obtained. It should be noted that the "spread" between the high and low speeds makes these instruments particularly effective since measurements made at speeds having less than a ratio of 2:1 between them are apt to be uninformative.

4. Extreme versatility: The low rotational speeds on the "T" series Viscometers make these instruments particularly suited for use with the Brookfield Helipath Stand which is used for measurement of gels, pastes, and other non-flowing substances. High shear measurements on other materials can be made with the same Viscometer by increasing the speed.

Eight speed Synchro-Lectric Viscometers should prove to be extremely useful for use in research laboratories, universities, or in any control laboratory where an extremely wide variety of products is measured or non-Newtonian flow must be checked and controlled.

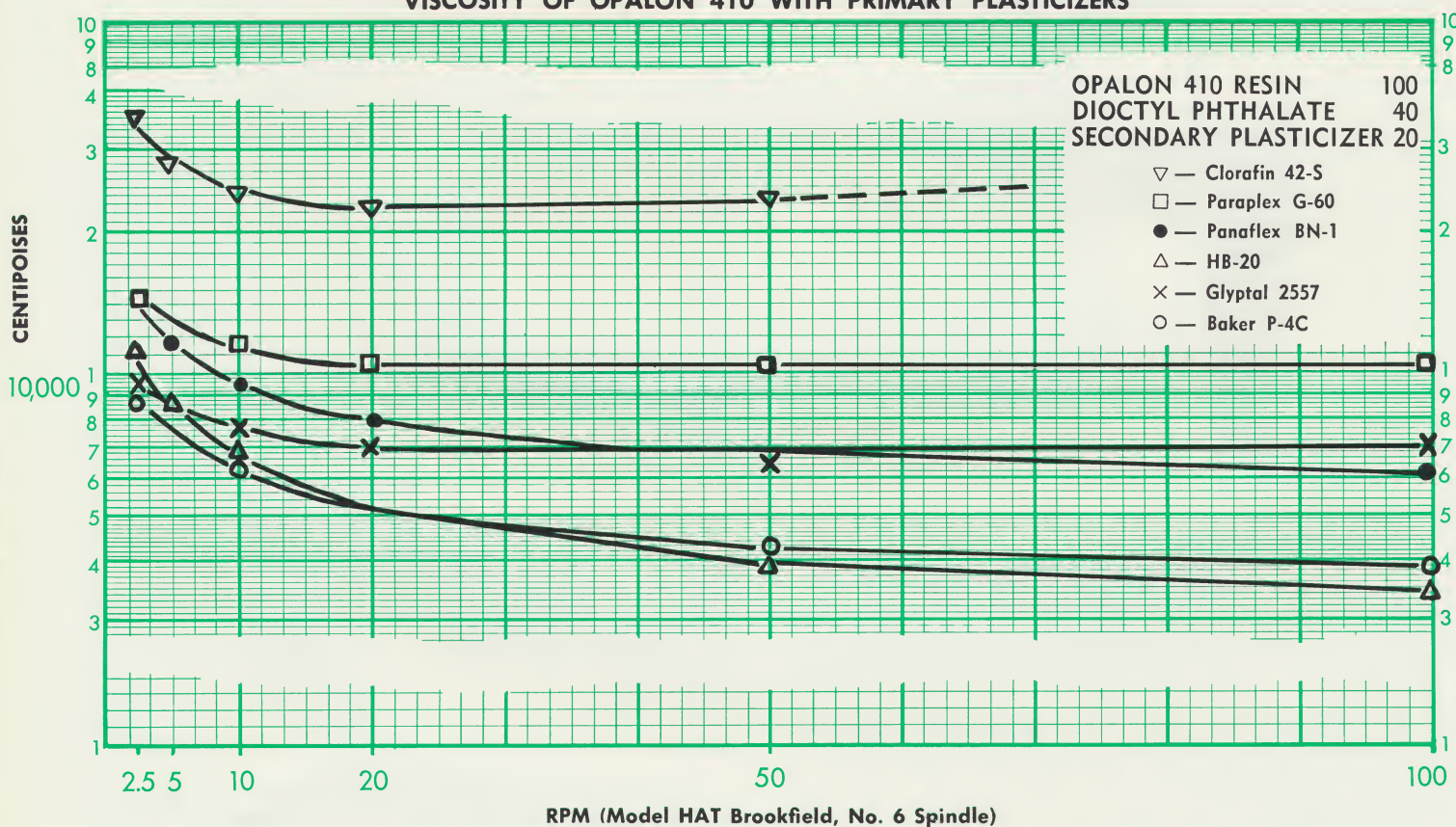
LVTfour spindles, speeds —
60, 30, 12, 6, 3, 1.5, 0.6,
and 0.3 rpm**RVT**seven spindles, speeds —
100, 50, 20, 10, 5, 2.5, 1.0,
and 0.5 rpm**HAT**seven spindles, speeds —
100, 50, 20, 10, 5, 2.5, 1.0,
and 0.5 rpm**HBT**seven spindles, speeds —
100, 50, 20, 10, 5, 2.5, 1.0,
and 0.5 rpm

Number of Ranges	Minimum Range	Maximum Range (with std spindle)	Maximum Range (Helipath Stand)
32	0-100 cps	0-2,000,000 cps	0-3,330,000 cps
56	0-100 cps*	0-8,000,000 cps	0-20,000,000 cps
56	0-200 cps*	0-16,000,000 cps	0-40,000,000 cps
56	0-800 cps*	0-64,000,000 cps	0-160,000,000 cps

*Turbulent effects may be noted below 80 cps when used at 100 rpm. This will in no way affect reproducibility or sensitivity in this region.

Typical Flow Curve Made With 8 Speed Brookfield Synchro-Lectric Viscometer . . .

VISCOSITY OF OPALON 410 WITH PRIMARY PLASTICIZERS



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Brookfield

ENGINEERING LABORATORIES

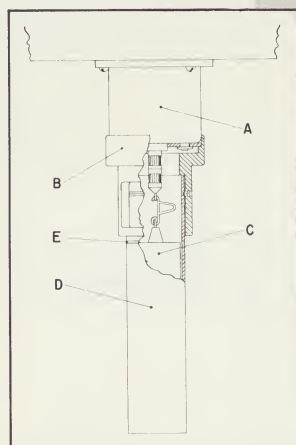


Stoughton, Mass.

THE BROOKFIELD U. L. ADAPTER

for use with LV models
of the Brookfield
Synchro-Lectric Viscometer

**Measurement of ultra
low viscosities possible
through use of this ac-
cessory.**



The measurement of low viscosity materials with extreme precision and accuracy may be readily accomplished with Brookfield model LV Synchro-Lectric Viscometers when used with the Brookfield U. L. Adapter. Measurements over a minimum range of 0-10 cps — spread over the 13½" Viscometer scale — can be made with a reproducibility of 0.02 centipoises. Other ranges of 0-20, 0-50, and 0-100 cps are also available as the speed of the Viscometer is reduced.

With the exception of pipette-type instruments, most other Viscometers fail to function properly in the low viscosity region. They can provide only an indication of the material's centipoise viscosity, are generally lacking in sensitivity, and frequently are unduly affected by the specific gravity of the test material. As a rule their operation requires a certain technique which must be duplicated if consistent results are to be obtained.

The U. L. Adapter will eliminate this trouble — truly sensitive readings of great accuracy and precision are obtained that are not affected by operating technique or the test material's specific gravity. While most materials in this range have Newtonian flow properties, this equipment is the only type available that can be used with the few that do not.

The U. L. Adapter consists of a precision cylindrical spindle rotating inside an accurately machined tube. Alignment of these parts is accomplished by a special pivot housing and adapter body. Two tubes are furnished with each Adapter — one has an open end for measurements in tanks, or beakers, while the closed tube, holding a 25 cc sample, can be immersed directly in a temperature bath. While the equipment must be initially aligned in our fac-

tory, it may be quickly removed and replaced at any time if normal use of the LV Viscometer is required.

The following procedure is necessary for installing the U. L. Adapter. The spindle coupling nut should be screwed onto the mating viscometer coupling screw. The main adapter body (B) should be inserted over the pivot housing (A) and turned until it snaps flush against the bottom of the housing. The spindle (C) is then attached by the hook-eye arrangement shown. The tube (D) is placed over the spindle and attached in the following fashion: match vertical slot on side of tube to screw found in side of adapter. Push tube up until horizontal groove in tube coincides with screw. Rotate tube slightly to left or right. The viscometer can then be operated in its normal fashion. When using open tube immerse in tank or beaker to groove (E).

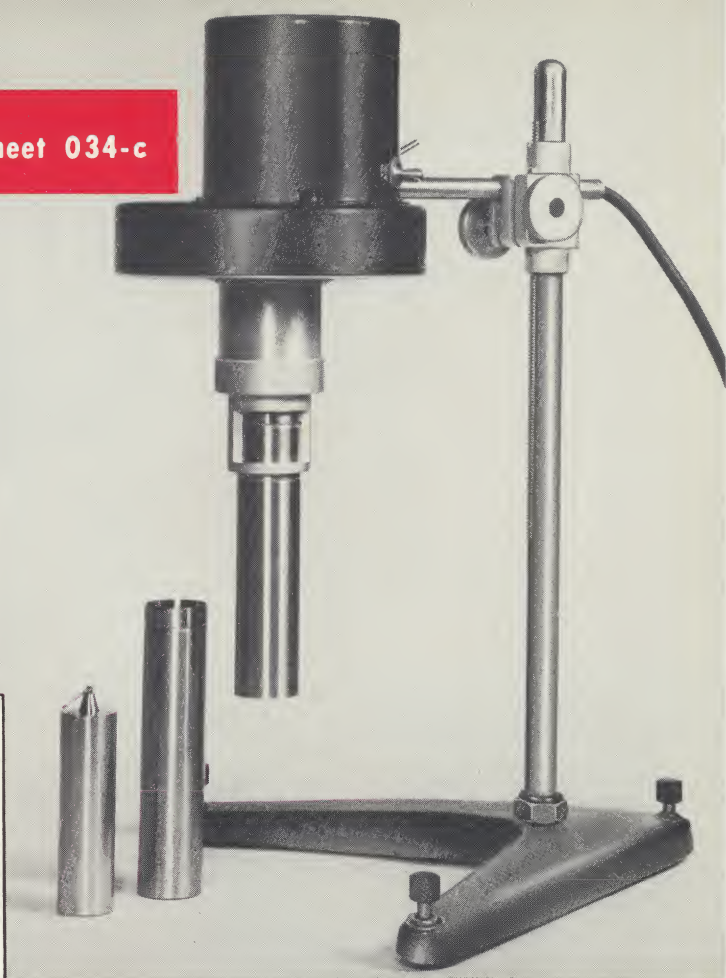
The Viscometer should be leveled during its operation. (A leveling stand is suggested) The tubes should be gently tapped or tipped prior to measurement to eliminate air bubbles from the fluid. The spindle and tubes should be cleaned before use.

The U. L. Adapter has the following ranges:

RPM	RANGE	Multiply reading on 100 scale by this factor to get correct viscosity.
60	0-10 cps	0.1*
30	0-20 cps	0.2**
12	0-50 cps	0.5
6	0-100 cps	1.0

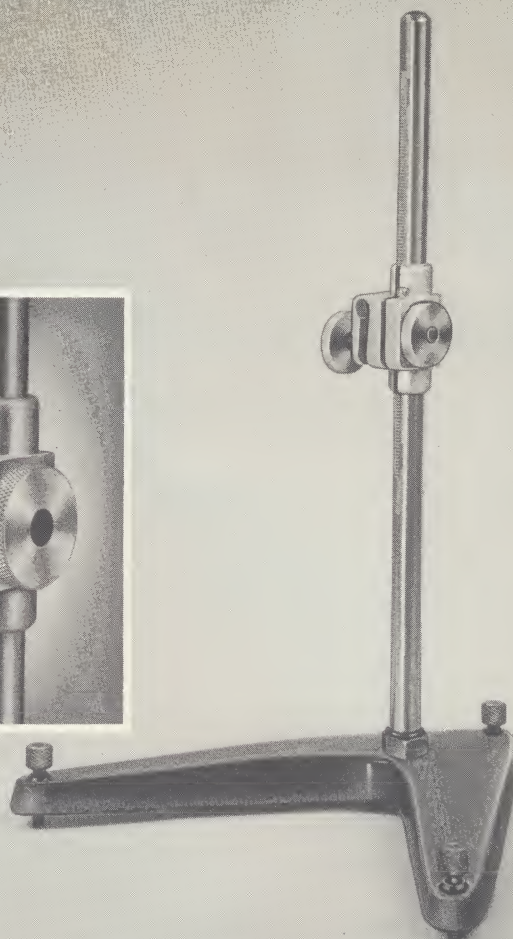
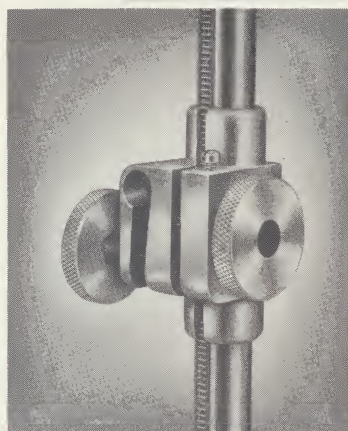
*deduct 0.4 from reading before multiplying to correct for windage.

**deduct 0.1 from reading before multiplying to correct for windage.



BROOKFIELD LABORATORY STANDS

**Provide dependable
tailor-made mounting
for Brookfield Synchro-
Lectric Viscometers.**



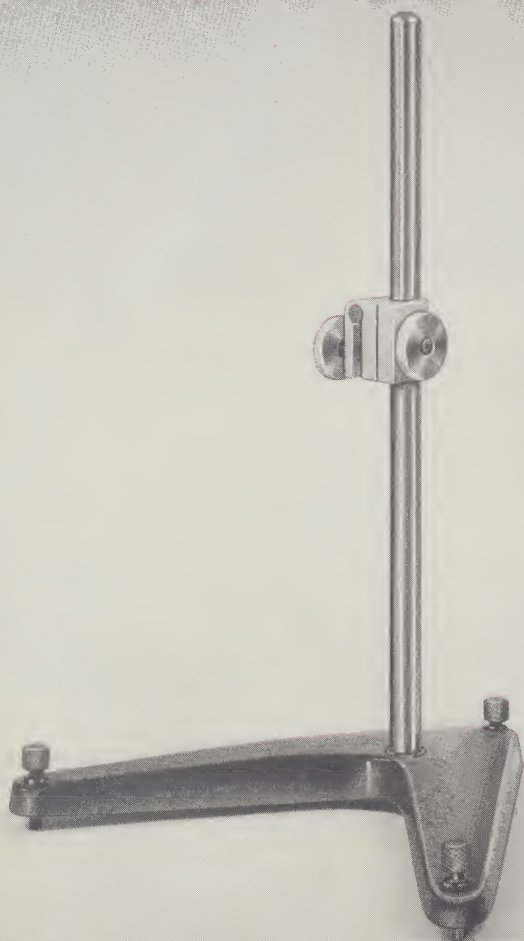
MODEL A

Laboratory Stand — Model A. Has a heavy cast iron base finished in corrosion resisting and easy to clean porcelain enamel. Screws are located in base for easy and accurate leveling of Viscometer. The support rod is $\frac{3}{8}$ " steel, surface treated against corrosion.

A special clamp is provided which will securely hold the Viscometer. The clamp is part of a rack and pinion system which enables the Viscometer to be quickly raised or lowered to a precise point. Thus, the Viscometer spindles can be immersed to the correct depth with a minimum of trouble.

Laboratory Stand — Model B. This stand is similar to the model A described above. It is supplied with a dependable clamp which must be manually adjusted for height — it is identical in all other respects.

The standard height of the support rod is 14" — extensions may be provided in lengths of $3\frac{1}{4}$ " and $7\frac{1}{4}$ " which will increase the Stand's maximum height to $24\frac{1}{2}$ ".



MODEL B

An inexpensive accessory which will insure your Viscometer's optimum performance and long life.

Brookfield

**ENGINEERING LABORATORIES, INC.
STOUGHTON, MASSACHUSETTS**



ENGINEERING LABORATORIES, INC.
240 CUSHING STREET • STOUGHTON, MASSACHUSETTS

Viscometer PRICE LIST

Prices are f. o. b. Stoughton, Mass.

Feb. 1, 1966

LV MODELS with set of (4) #302 stainless steel spindles and carrying case.

LVF—Four speed: 60, 30, 12, 6 rpm.	\$395.00
LVT—Eight speed: 60, 30, 12, 6, 3, 1.5, 0.6, 0.3 rpm.	460.00

RV MODELS with set of (7) #302 stainless steel spindles and carrying case.

RVF—Four speed: 20, 10, 4, 2 rpm.	\$395.00
RVF—100 rpm. model, four speed: 100, 50, 20, 10 rpm.	395.00
RVT—Eight speed: 100, 50, 20, 10, 5, 2.5, 1.0, 0.5 rpm.	460.00

HA—HB MODELS with set of (7) #302 stainless steel spindles and carrying case.

HAF—Four speed: 10, 5, 2, 1 rpm.	\$395.00
HAT—Eight speed: 100, 50, 20, 10, 5, 2.5, 1.0, 0.5 rpm.	460.00
HBF—Four speed: 10, 5, 2, 1 rpm.	395.00
HBT—Eight speed: 100, 50, 20, 10, 5, 2.5, 1.0, 0.5 rpm.	460.00

ACCESSORIES

U.L. Adapter (Includes factory installation)	\$125.00
Helipath Stand (Complete with spindles and coupling)	142.00
Helipath Stand (Reversible model, includes spindles and coupling)	175.00
Laboratory stand, model A	22.00
Laboratory stand, model B	13.00
Counter Rotating Mixer	115.00

MISCELLANEOUS EXTRAS

Voltage other than 110 volts A. C. (Helipath Stand and Mixer)	\$ 15.00
Mercury switch (used in inflammable atmospheres)	9.50

Special shape spindles, design modifications, special materials, etc., on application.

U.L. approved (Class I, Group D) Explosion Proof model
of above viscometers, add \$235.00



Spindle

PRICE LIST



Prices are f. o. b. Stoughton, Mass.

#302 Stainless Steel Spindles

LV MODELS

Per set (Nos. 1 - 4)	\$69.00
#1	27.50
#2	17.50
#3	16.00
#4	13.00
#5*	13.00

RV-HA-HB MODELS

Per Set (Nos. 1 - 7)	\$96.00
#1	29.00
#2	12.50
#3	12.00
#4	11.50
#5	11.00
#6	10.50
#7	14.00

(All spindles above are also available in Carpenter #20 stainless steel.
Prices will be furnished on request.)

* furnished as special item.

TYPE D EXTENSION (for use with standard spindles).

Lengths up to three feet \$9.00 Three to six feet \$10.00

TYPE S EXTENSION (with spindle of #302 stainless steel).

LV MODELS

#1 spindle	\$34.00
#2	22.00
#3, #4	18.00

RV-HA-HB MODELS

#1 spindle	\$34.00
#2, 3, 4, 5, 6 and 7	18.00

Above prices for overall lengths up to three feet. For lengths from three feet to six feet, add \$1.00.

For lengths over six feet write for prices and give description of application to determine feasibility.

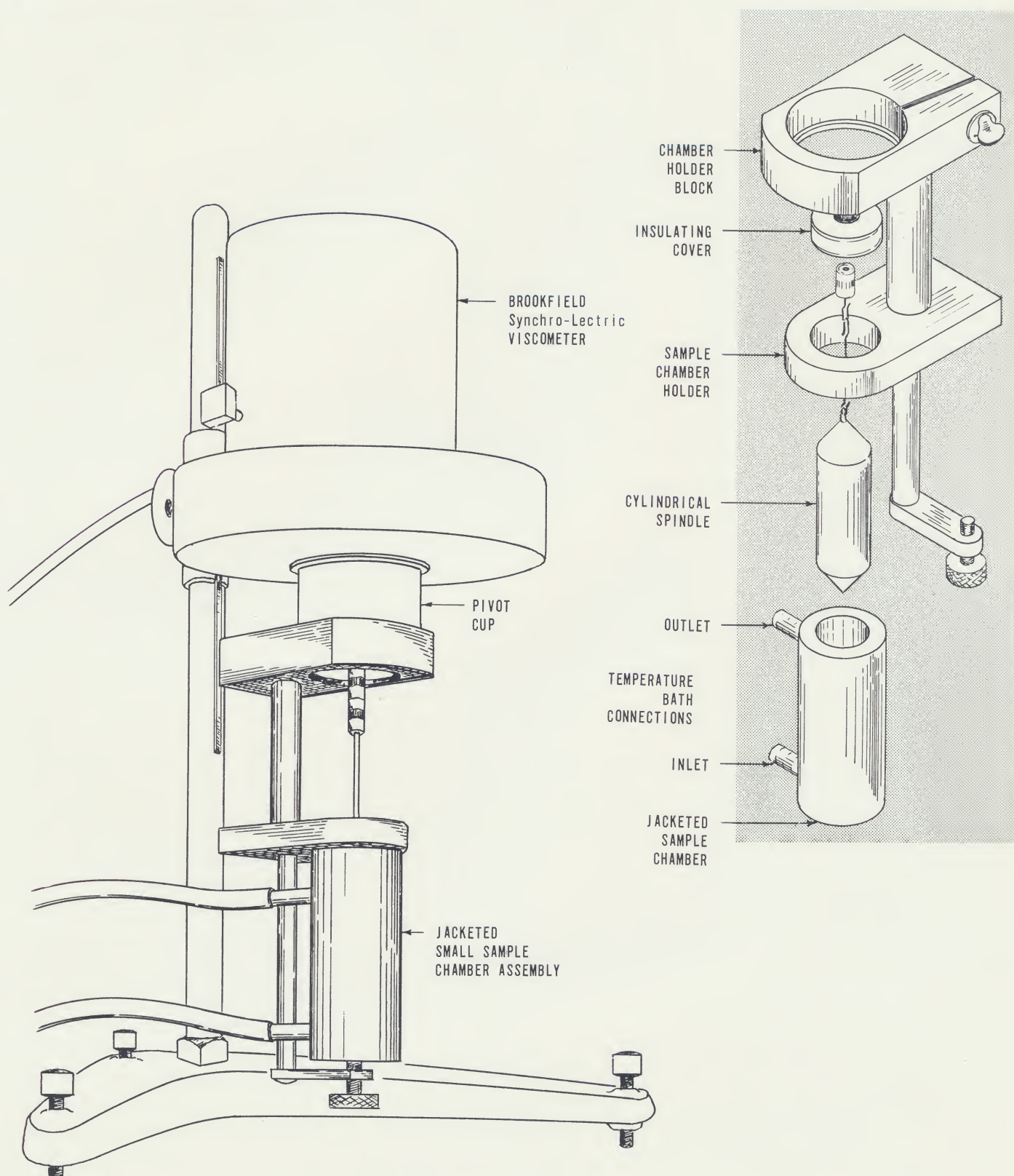


BROOKFIELD ENGINEERING LABORATORIES, INC.

BROOKFIELD Synchro-Lectric VISCOMETER

JACKETED SMALL SAMPLE CHAMBER-
COAXIAL CYLINDER SERIES

240 Cushing Street, Stoughton, Massachusetts, U. S. A.



THE BROOKFIELD COUNTER-ROTATING MIXER

*Two Counter-Rotating Propellers produce
effective mixing results in minimum time.*

By using two counter-rotating propellers, the Brookfield Counter-Rotating Mixer achieves a truly unique mixing action. Unlike laboratory stirrers, the Brookfield Counter-Rotating Mixer fully utilizes its power to provide maximum mixing effectiveness. Here's how —

Two propellers rotating in opposite directions rapidly draw all material into a small zone between the two blades. Here the material is subjected to a violent shearing and cutting action before it is expelled. An annular, rather than a circular, flow pattern is created which insures the rapid re-entry of material into the high shear zone. This annular flow pattern also causes heavier particles to enter this zone rather than be swept to the outside of the container by the centrifugal forces a circular flow would create. In addition, the annular flow eliminates the usual vortex and rise in liquid level — the Brookfield Counter-Rotating Mixer can thus be used in nearly filled containers with no danger of slop over and a minimum of air entrainment.

*Fast - Efficient
Complete Mixing*



DESIGN FEATURES

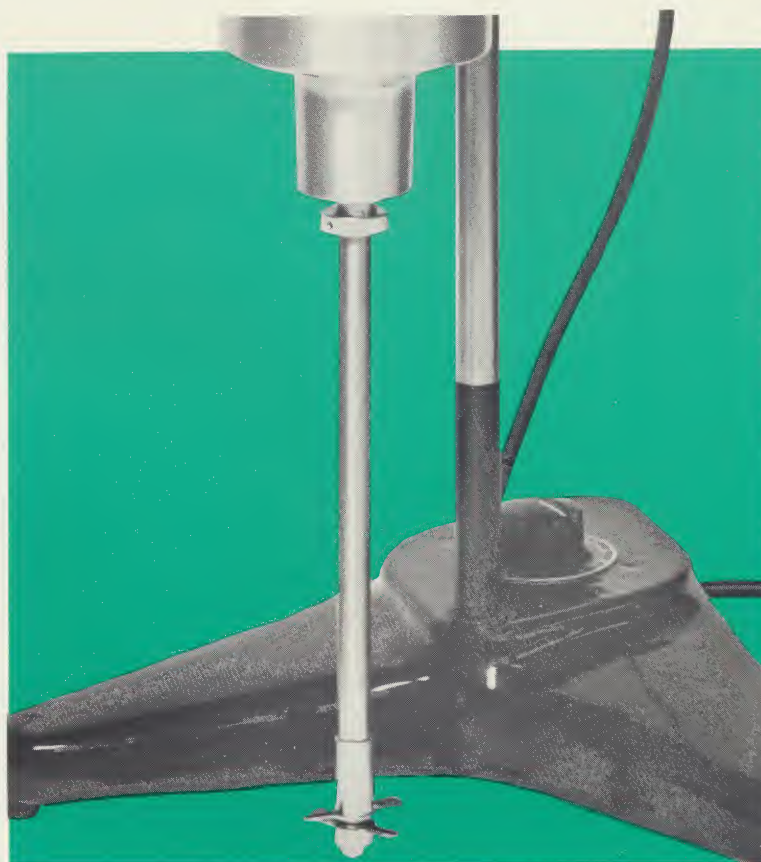
Both propellers of the Brookfield Counter-Rotating Mixer are driven by a single 1/10 h.p. motor producing up to 80,000 scissor-like cuts per minute. Counter-rotation is obtained by driving the propellers through steel and fibre gears.

The propellers are attached to two concentrically mounted shafts. Both shafts may be completely removed from the Mixer with no tools required; their removal permits easy replacement, cleaning, or sterilization. If desired, extra shafts may be purchased which will permit the Mixer's almost continuous use in a number of samples with no time lost between for cleaning.

The shafts have upper and lower rulon bearings both of which are readily replaceable.

The relative rotational speed of the propellers may be varied from 0 to 20,000 rpm by means of a continuously variable control.

The Brookfield Counter-Rotating Mixer is mounted on a porcelain-enamel coated cast iron



base holding both the speed control and an on-off switch. A smooth acting clamp permits the Mixer's easy positioning. All immersed parts are of 18-8 stainless steel with the exception of the lower bearings.



A TRULY NEW MIXER

- 80,000 scissor-like cuts per minute
- Mixer draws all material into mixing zone
- no vortex — no slop over
- shorter mixing time
- simplified cleaning problem
- removable shafts for replacement or sterilization
- variable speed control

Brookfield

ENGINEERING LABORATORIES, INC.

Stoughton, Mass.

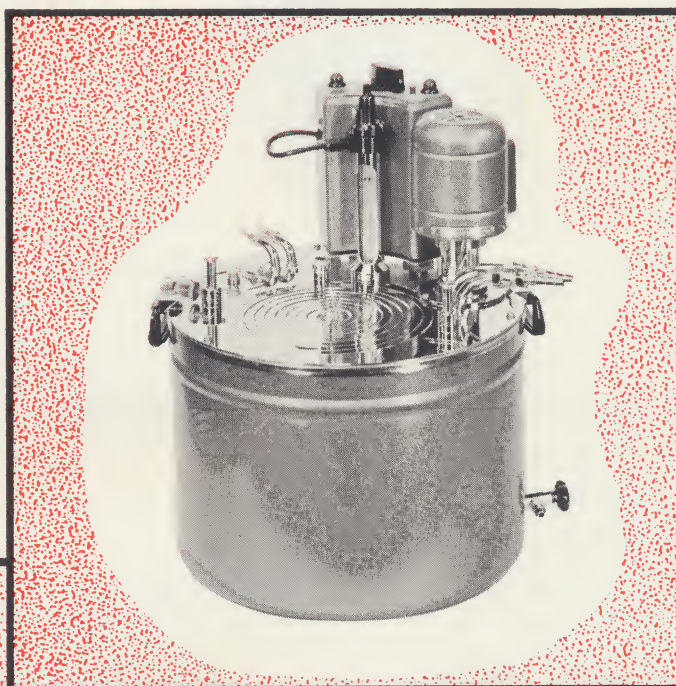
NOW...from
BROOKFIELD

CONSTANT TEMPERATURE BATHS

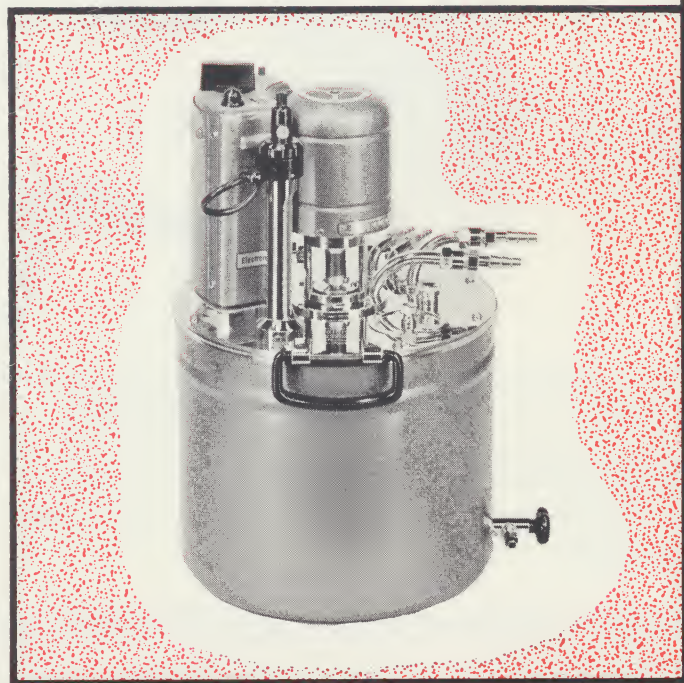
For VISCOSITY TESTING
and General Laboratory Use

OF ADVANCED DESIGN AND PRECISION
WORKMANSHIP . . . BUILT TO LAST WITH
CONTINUOUS USE IN VARIED APPLICATIONS

Model NB - RESERVOIR
and CIRCULATING

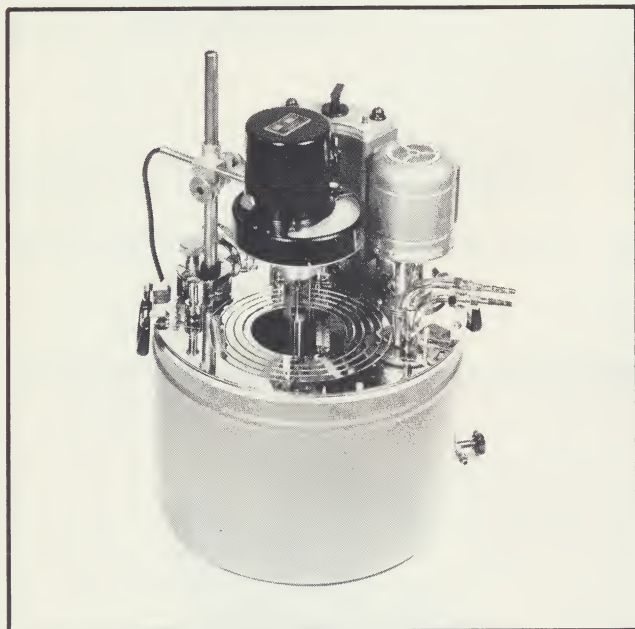


Model N -
CIRCULATING



Brookfield

CONSTANT TEMPERATURE BATHS applicable to general laboratory use of a chemical, physical or biological nature. These baths are optionally equipped for convenient use with BROOKFIELD SYNCHRO-ELECTRIC VISCOMETERS. Both reservoir and circulating models excel in their reliability, quality construction, operational simplicity and space-saving design. Accurate temperature control is achieved by means of the time-proven magnetic thermoregulator and continuous duty electronic relay, included with all models as standard equipment. Baths are normally supplied with a thermoregulator for a temperature range of 0-100 degrees C.



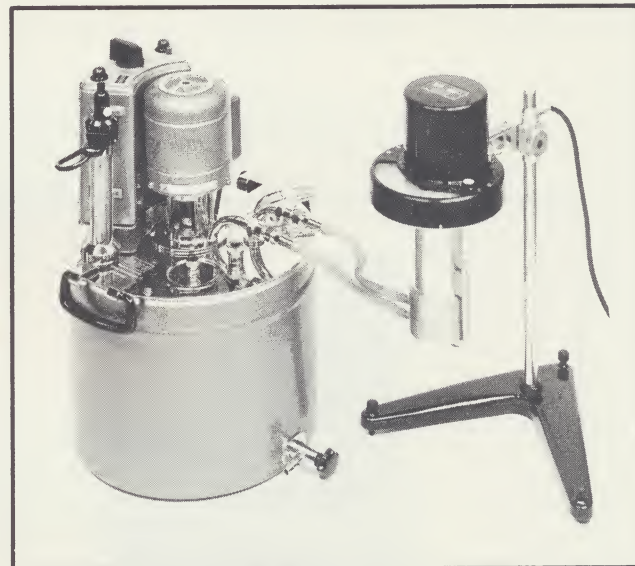
MODEL NB CONSTANT TEMPERATURE BATH
WITH BROOKFIELD VISCOMETER

Model NB - RESERVOIR and CIRCULATING

WORKING RANGE -30 to 180 C
AVERAGE ACCURACY $\pm .01$ C
PUMP OUTPUT 4.5 gal/min.
MAXIMUM HEAD 13 ft.
HEATER RANGES 500/1000/1500 watts
MOTOR LOAD 70 watts
RESERVOIR CAPACITY 3 gallons
RESERVOIR ACCESS 7 inches max.
INTERNAL LIQUID DEPTH 7 inches
POWER SUPPLY 115v 60 cyc. AC
DIMENSIONS 14.2 in. Dia.
x 17.4 in. High
WEIGHT 28 lbs 10 oz Net
PRICE \$445.00

Model N - CIRCULATING

WORKING RANGE -30 to 180 C
AVERAGE ACCURACY $\pm .01$ C
PUMP OUTPUT 4.5 gal/min.
MAXIMUM HEAD 13 ft.
HEATER RANGES 500/1000/1500 watts
MOTOR LOAD 70 watts
RESERVOIR CAPACITY 1.66 gallons
RESERVOIR ACCESS 2.15 inches
INTERNAL LIQUID DEPTH 7 inches
POWER SUPPLY 115v 60 cyc. AC
DIMENSIONS 11 in. Dia.
x 16.5 in. High
WEIGHT 22 lbs Net
PRICE \$335.00



MODEL N CONSTANT TEMPERATURE BATH
WITH WELLS-BROOKFIELD MICRO VISCOMETER

PRICES F.O.B. STOUGHTON, MASSACHUSETTS

Additional models of higher temperature, suction and pressure, and cold thermostats are available. We welcome your inquiry and specifications.

Brookfield

BROOKFIELD ENGINEERING LABORATORIES, INC.
240 Cushing Street Stoughton, Mass. U.S.A.

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